The Economics of Children

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I. Introduction

One of the basic insights provided by the household production model applied by economists to the determination of fertility is that the quantity of children a family has is the outcome of but one of a large variety of family decisions based on the relative benefits and costs of different activities (Willis, 1973; Becker 1965). Among these joint decisions, each influenced by the same set of family and environmental characteristics, are those involving the allocation of the time of family members among activities providing satisfaction and/or resources--the time parents spend in the household (and there among which household activities) and in the labor market and the time children spend in school or at work. Parental characteristics, such as "earning power" may also vary over time , however, as the direct result of these allocative decisions and thus decisions may also be modified in a sequential manner over the life cycle. (This sequential aspect of household decision-making is considered in a later section.)

This section of the report will be broadly concerned with the identification of the costs and benefits of investing parental time and goods in children and those characteristics of parents and the environment of a less-developed country that may influence them. In particular, two aspects of child investment which appear to be closely related are examined--the determination of the number of children and the quantity of resources devoted to each child as reflected, in part, in the formal schooling of children.

In a less-developed country the benefits of children are twofold--children provide utility or satisfaction to parents and they may as well contribute significantly to family income. Given that children are desired for their own sake (are economic goods), economists assume that parents with

more resources available to them will most likely desire to have more children and to invest more resources (schooling) in each. Thus, the amount of physical and human capital of the parents would be expected to be positively associated with both numbers of children and schooling, ceteris paribus. (However, the accumulation of capital may be one of the activities which compete with child investment for parental resources.)

In an environment in which children can make a significant pecuniary contribution, we would expect to observe parents choosing to have a higher number of children than would families in which the potential returns to child employment are small. Among the observable variables influencing the economic contribution of children are 1) the wages children earn, a direct measure of the value of children's time in the labor market, and 2) the prices (and in some cases quantities) of factors complementary to child labor in agricultural production for children who choose to work on the family farm. Among these latter farm variables would be the price of adult agricultural laborers, prices of farm implements, the stock of animals, prices of agricultural output, and the quantity and quality of the family's land holdings; the latter two, for instance, being positively associated with the marginal product of children and thus with family size.

The agricultural production variables, in addition, will influence the allocation of the child's time among leisure, schooling, and work activities. Those variables positively associated with the pecuniary returns from child work time, would be expected to have a negative association with the level of schooling a child receives since the value of the contribution of

children at the margin would be lost if the child is attending or travelling to school. Thus, an increase in family landholdings, for example, would not only raise family income but would as well increase the marginal product of children and thus raise fertility unambiguously;the schooling level of children might decline, however. We thus would expect to observe in a cross-section of families a positive association between landholdings and family size but a weak or negative relationship between land and child schooling. Similarly, an increase in the wage rates children could earn would raise household income and the returns to bearing children and child labor, but would also increase the opportunity cost of child schooling and child leisure.

Another important factor influencing the relative costs and returns to child schooling and the quantity of children is the value of the mother's time. If child care requires more of the wife's time then any other household activity, increases in the value of her time will lead to a shift in resources (time and goods) away from children (Ben-Porath, 1973). In particular, if there is a rise in the wage a woman can earn by working at a job where she cannot simultaneously tend to her children, she will allocate more of her time to market work and less to child care. Since an increase in the wife's wage will also add to family income but should not importantly affect the costs of schooling, correlates of the value of the wife's time should be positively associated with child schooling and negatively related to fertility, if the opportunity cost effect is sufficiently strong. Measures of the time value of the wife are discussed in detail in part 3.

These considerations lead to a more general conclusion regarding the interrelationship between child schooling, fertility and economic development. In a stagnant, non-industrialized society the returns to imparting skills to children are likely to be low relative to those from having a large family and thus we would observe in such a society high birth rates and low levels of schooling. In an economy undergoing development, however, incentives for increased schooling would rise, leading to a shift in demand from large families to families with fewer but more educated children. The increased schooling of women would in turn raise the returns to women's time in market activities thus increasing the opportunity cost of children and promoting further reductions in family size.

In the next sections attempts are made to rigorously test some of the relationships between economic variables influencing the costs and benefits of children and the family decisions which underlie these scenarios in a manner consistent with the joint determination structure of the household model. Econometric techniques are applied to two household data sets from the Philippines--the 1968 and the 1973 National Demographic Surveys. In part 2, the determinants of fertility, child schooling and child labor-force participation are examined jointly to show that consideration of these three aspects of children in a single analysis provides a better understanding of the relationship between economic conditions in an LDC and the demand for children than does concentrating solely on the determinants of family size. In part 3, the relationship between the employment of women and fertility behavior is focussed on utilizing a sequential decision-making framework which is shown to be a more useful means of ascertaining the impact of female employment- creation on fertility than the single period household model. The broad conclusions derived from the empirical results obtained in parts 2 and 3 are summarized in part 4. Particular attention is paid to the additional data needed to further explore some of the unanswered questions derived from those results. Alternative existing data sets from the Philippines and Indonesia are

examined for their potential use in this regard and the possibility of a new collaborative survey in either the Philippines or Indonesia is discussed in part 5.

II. Child Schooling, Child Labor and Fertility in the Philippines

In this section the economic model of the household briefly outlined above is applied to micro data from the Philippines in order to test some of the specific implications of the general model and to derive empirical estimates of relationships which may lead to policy conclusions regarding fertility, child schooling and employment. The subset of the family decisions examined are those relating to the number of births in the household, the schooling attainment, and the work activities of male and female children. Proxies for these five household activities are used as dependent variables in a multivariate regression analysis in which each of the five are assumed to be jointly influenced by a common set of exogenous variables. Thus a set of 5 "reduced form" equations is estimated.

The procedure adopted here contrasts with that used by Harman (1970) in his study of the same data set (described below) in which he attempted to estimate the direct impact of some of the endogenous decision variables (the mother's labor-force participation, for example) on fertility using simultaneous equation estimating techniques. To do this, however, requires imposing usually arbitrary or ad hoc restrictions on the sets of variables assumed to influence each type of decision. The approach here, based on the household model, assumes instead that all the household decisions concerning children reflect the same set of circumstances; while a relationship may be observed between the schooling of children and family size, for example, this does not imply that increasing child schooling will actually

influence fertility. We instead concentrate on measuring the joint differential impact of an exogenous change in any one of the relevant economic variables on all the endogenous variables under study.

Examining a number of household decisions has two advantages over the more common single equation approach in which only the determinants of one aspect of household decisions are considered in isolation. First, since the household model provides a variety of implications with regard to household decisions, empirically estimating more than one at one time provides a multi-dimensional test of that model. This is particularly important because, as was emphasized in the previous section, there are few unambiguous "predictions" with respect to the influence of a given family characteristic on a particular decision variable. Rather the model imposes restrictions on the relationships between the coefficients of each explanatory variable <u>across equations</u>.

The second advantage of this approach is that a better understanding of the estimated relationship obtained in any equation between a family characteristic and the decision variable is possible. For example, if the wage rate of children is found to be positively related to fertility this result alone would not indicate whether the relationships was due to an income or, in addition, a relative price ffect. However, finding as well, a negative correlation between the child wage and schooling would suggest that the child wage does have a price effect, as a rise in the wage increases the opportunity cost of schooling. (Thus implying that the pecuniary returns from children importantly influence family decisions).

The Data

The data set utilized in this section is taken from the 1968 Philippines National Demographic Survey data tape, which contains a country-wide random sampling of 7,237 households. This data set is particularly well-suited for studying the "economics of children" as it provides, in addition to detailed demographic data, information on the amount of work time and the level of schooling of all household members aged 10 or above and on the total earnings of children. However, no data on the agricultural inputs or assets (land size, for example) held by the family or on offspring not living at home are reported. Moreover, the information provided is not sufficient for the computation of the price of time of the mother (see part 3). The sub-sample of households considered are those containing once-married women aged 35-49 whose husband was still living in the household at time of the survey and who also had only one marriage.

The dependent variable used to represent the outcome of fertility decisions is the number of children ever born to the wife. The construction of the schooling and labor-force participation variables, however, is less straightfoward. Previous studies of family schooling decisions have been based on aggregate data and have utilized aggregate age-specific school enrollment rates (DeTray, 1973; Edwards, 1975; Rosenzweig, 1975a, 1975b). Other studies employing micro data, have related the schooling attainment of an individual to his or her socio-economic background ( ). For the purposes here, however, a variable representing the desired educational level of all the children in the family at the household level is required. Harman attempted to compute such a proxy from the Philippines

data set but noted that the variation in the family age-composition of children importantly affected his measure of child educational attainment which consisted of the sum of the years of schooling of each child in the household divided by the total number of years the children could spend in school.

To standardize for age effects, such as that older offspring are likely to spend a lesser proportion of their life in school than younger children, it is necessary to construct an age-specific schooling attainment schedule so that the years of schooling of the children in the household (characterized by a particular age-distribution) can be compared to some "norm". The average number of years of schooling (+1 if the child is currently attending school) of children aged 10 through 25 years of age computed for both boys and girls is reported in Table 1. This schedule is used to construct S_{kj} the sex-specific schooling index for each family j:

$$S_{kj} = \frac{\sum_{i=1}^{n} S^{A}_{ij\chi k}}{\sum_{i=1}^{n} S_{i\chi k}} \qquad \chi = 10 \ldots 25$$

where k = male, female

n = number of children living in household j

$S_{i\chi k}$ = average schooling attainment of individuals of sex k in the whole sample corresponding to family member i's cohort (aged χ).

$S^{A}_{ij\chi k}$ = actual schooling attainment of individual i of sex k and age χ in household j.

Table 1 Years of Schooling and Hours Worked Per Week by Age, Sons and Daughters

	Schooling		Hours	
Age	Sons	Daughters	Sons	Daughters
10	4.10	4.18	2.89	1.33
11	4.50	4.81	5.00	2.28
12	5.34	5.63	7.21	3.13
13	6.00	6.29	9.26	4.92
14	6.41	6.83	14.63	5.28
15	7.19	7.51	16.00	9.77
16	7.36	8.10	19.89	10.82
17	7.88	8.32	20.28	12.36
18	8.19	8.60	24.94	12.58
19	8.66	9.22	24.56	13.24
20	8.78	10.02	26.69	12.50
21	9.09	10.56	29.66	15.61
22	8.82	10.38	30.07	19.04
23	9.55	10.94	31.60	21.59
24	9.05	9.85	32.35	22.64
25	9.90	10.46	36.35	26.22

Source: 1968 Philippines NDS data tape.

Sample size: 2330

Two remaining sources of error in S_{kj} are that 1) the schooling levels of children who have left the household (and who are probably less educated) are not reported and 2) some proportion of children living at home will not have completed their schooling. As the former reporting error should tend to result in the overstatement of the desired level of schooling for households in which the desired level of educational attainment is low and the latter problem will tend to make the index understate the optimal schooling levels in households where the desired level of schooling is high, the variable coefficients in the schooling equations may be biased toward zero.

A similar age-standardization is applied to the total number of hours worked in the survey week by offspring in order to compute an index of child employment W_{kj} for each household j. The age-specific schedule of weekly hours spent in the labor market or in unpaid family work by sex for the whole sample is also shown in Table 1.

$$W_{kj} = \frac{\sum_{i=1}^{n} W^{A}_{ij\chi k}}{\sum_{i=1}^{n} W_{i\chi k}} \qquad \chi = 10 \ldots 25$$

where $W_{i\chi k}$ = average weekly hours worked by individuals of sex k in whole sample corresponding to family member i's cohort of age χ.

$W^{A}_{ij\chi k}$ = actual number of hours worked in survey week of individual i of sex k and age χ in household j.

Again, the labor-force behavior of children not living at home but who might be contributing to family income is unfortunately excluded. W_{kj} is thus probably an understatement of the level of child employment for families in which children would tend to work more hours.

The set of indpendent variables used in each of the five regression equations consists of the province-level wage rate of children, the wife's years of schooling and years of schooling squared, husband's schooling, husband's expected wage, farm residence, husband's age, wife's age, the province-level infant mortality rate, a religion variable, and a dummy indicating knowledge of specific contraceptive techniques.

The child wage rate was computed by dividing the total earnings of children in the household by the sum of their weekly hours worked multiplied by 50. Because no children above age ten worked in a significant proportion of households, however, the mean of child wages in the province, computed on the basis of working child families, was used to represent the child wage rate facing each individual household. Averaging the child wages by province should have the advantage as well of reducing the relative size of the error component of this variable. More importantly, the value of the child wage variable in the province cannot be influenced by the behavior of the individual household members thus insuring its exogeneity in the equations.

The child wage rate should have a positive effect on fertility--increases in the child wage would not only raise family income but would also reduce the net cost of children (total costs less pecuniary returns), but the influence of the child wage on child schooling and labor-force participation

is not unambiguous. The child wage should, however, have an algebraically less strong influence on child schooling than on fertility because the positive income may be offset by the negative school opportunity cost effects, as discussed above. Similarly, the employment effect of the child wage cannot be known a priori-- increases in child wage rates, by raising incomes, would increase the demand for child leisure and hence reduce hours worked, but would also raise the opportunity cost of not working and thus would, on that account,increase child employment. The signs of the child wage coefficients in the schooling and hours equations will thus depend on the relative strengths of the two effects; however, we would expect that,whatever its value,the child wage coefficient sign in the child schooling equation would be opposite to that in the child employment equation.

The wife's schooling variable is used to represent the value of the time of the wife, the best proxy available in this data set, and thus would be expected to have a negative effect on fertility (controlling for contraceptive knowledge), a positive effect on child schooling, and a negative association with child work time (positive association with child leisure and schooling). A quadratic schooling term is also employed as a regressor to test for any non-linear effects of female schooling on the dependent variables, particularly fertility(as found by Ben-Porath (1973)).

The wage of the husband is an instrumental variable, obtained by regressing the computed husband's wage (yearly income divided by weekly hours x 50 for working husbands) against the husband's schooling, his age and age squared, an occupational dummy variable, and his father's schooling level. The influence of this variable, as it mainly represents an income effect,

would be expected to be positive on fertility and child schooling and negative on child employment (positive on child leisure and schooling). The coefficients of the husband's schooling variable in the five equations should replicate in sign those of the husband's wage.

Because no information on agricultural inputs is provided in the NDS data tape, only a dummy variable representing whether or not the family is a "farm" household is used to capture the differential economic opportunities of children in farm families. We would expect that parents living on farms would have larger families, ceteris paribus, since living on a farm presumably increases the returns from child labor, but the variation in fertility among farm families, which is crucially related to farm characteristics, cannot be ascertained. Similarly, farm residence should also be negatively correlated with child schooling and positively associated with child employment (the 'hours 'dependent variable consists also of the hours worked by unpaid family laborers).

The infant mortality variable is the mean infant death rate of the province in which the household resides, computed from the actual infant deaths and births of all families with at least one live birth. It would be expected that the coefficient of this variable would be positive in the fertility equation--parents expecting higher child mortality rates, based on the past experience of other households in their geographical area, would tend to bear more children in order to achieve their desired family size goal.

Contraceptive knowledge is represented by another dummy variable, taking on the value 1 if the mother has heard of or used either of 5 contraceptive devices (pill, IUD, condom, foam, foam tablets) and 0 if the mother has

neither used nor heard of any of the five. The religion variable is the number of times per month the wife attends Catholic church services, set equal to 0 for non-Catholics.

Table 2 displays the matrix of coefficient sign "predictions" derived from the discussion of the expected economic effects on the 5 endogenous variables. No signs are provided for the religion and age variables as they are "controls" whose influence is not of primary concern here.

The Results

The coefficient estimates for the five equations obtained by applying ordinary least squares to the data are reported in Table 3. As can be seen the set of independent variables "explains" a statistically significant proportion of the variance of each of the 5 dependent variables. More importantly, however, with only one exception, all the estimated coefficient signs conform to the expected signs of Table 3, although not every coefficient is statistically significant.

The results indicate that an increase in the provincial child wage rate has, as expected, a statistically significant positive effect on the children ever born to families in that province. The income effect of such an increase appears to dominate the child labor returns component for both child schooling and labor-force participation--the supply curve of child labor hours appears to be backward-bending, children spending the increased income on both leisure and schooling. That the positive child wage effect on schooling is algebraically less than that in the fertility equation, however, indicates that the child wage opportunity cost of the schooling of children is not unimportant.

Table 2 Expected Coefficient Signs,
Reduced-Form Regression Equations

Independent Variables	CEB	Dependent Variable: Daughters' School Index	Dependent Variable: Sons' School Index	Dependent Variable: Daughters' Emp. Rate	Dependent Variable: Sons' Emp. Rate
Child Wage	+	- or +	- or +	+ or -	+ or -
Schooling of Wife	-	+	+	-	-
Schooling of Husband	+	+	+	-	-
Wage of Husband	+	+	+	-	-
Farm	+	-	-	+	+
Infant Mortality	+	?	?	?	?
Contraceptive Knowledge	-	?	?	?	?

Table 3 Regression Coefficients: Children Ever Born, Daughters' Schooling Rate, Sons' Schooling Rate, Daughters' Employment Rate, Sons' Employment Rate;

Married Women 35-49

Independent Variables	Dependent Variable: CEB	Daughters' School Index	Sons' School Index	Daughters' Emp. Rate	Sons' Emp. Rate
Child Wage	.0123*	.0012	.0010	-.0155*	-.0119*
	(.0057)	(.0008)	(.0008)	(.0069)	(.0037)
Schooling of Wife	.1191*	.0555*	.0548*	-.0578*	-.0158
	(.0581)	(.0076)	(.0080)	(.0695)	(.0387)
(Schooling of Wife)^2	-.0138*	-.0025*	-.0021*	-.0011	-.0018
	(.0032)	(.0005)	(.0005)	(.0042)	(.0024)
Schooling of Husband	.0143	.0114*	.0170*	-.0025	-.0349
	(.0380)	(.0050)	(.0052)	(.0455)	(.0251)
Wage of Husband	-.0069	.0011	.0002	-.0022	-.0011
	(.0071)	(.0010	(.0011)	(.0091)	(.0051)
Farm	.1105	-.0323	-.0452*	.6928*	.8215*
	(.1831)	(.0227)	(.0222)	(.2080)	(.1169)
Age of Husband	.0258	-.0028	.0022	-.0101	.0107
	(.0140)	(.0018)	(.0021)	(.0160)	(.0099)
Age of Wife	.1013*	-.0012	.0078	-.0554	-.0475
	(.0295)	(.0037)	(.0040)	(.0342)	(.0194)
Infant Mortality	.0222*	.0004	.0006	-.0027	.0005
	(.0038)	(.0005)	(.0005)	(.0043)	(.0024)
Religion of Wife	-.0604	-.0010	.0013	-.1779	-.0887
	(.0787)	(.0099)	(.0104)	(.0911)	(.0505)
Contraceptive Knowledge	-.0882	.0038	.0008	.0259	.0140
	(.0516)	(.0066)	(.0070)	(.0601)	(.0338)
R^2	.094	.258	.260	.070	.168
F-ratio	12.75*	29.24*	30.92*	6.30*	17.78*
d.f.	1818	1298	1357	1298	1357

Source: 1968 Philippines NDS data tape.

* Significant at the .05 level, two-tailed test.

The coefficients of the farm dummy variable also suggest that the economic contribution of children is an important determinant of family decisions. Moreover, they reveal that male children may be considered more of an economic asset than female children among Philippino farm households. Farm residence, presumably associated with greater opportunities for (returns to) child labor, is negatively associated with the schooling of sons but the correlation is not statistically significant among daughters and has a significantly greater positive correlation with sons' hours of work (outside the household) then with the employment level of female children.

The schooling of the mother (aged 35-49) appears to exert a negative effect on fertility, as predicted, but only at levels of schooling above 9 years. One reason for this result, that female schooling may be a poor proxy for the opportunity cost of children among older women, is explored in detail in the next section. The influence of the wife's education on the schooling of both male and female children is also non-linear but remains positive throughout the range of the educational levels observed in the sample (up to 22 years). The wife's schooling also exhibits the predicted negative influence on child employment (sons' and daughters'). This effect is also statistically significant--when both the linear and quadratic schooling variable are removed from the child labor-force participation equations the explanatory power of each equation is significantly reduced (F-test, 5 percent level).

The schooling of the husband also has the predicted effects, but the coefficients are only significant in the child schooling equations indicating that increases in the schooling attainment of <u>both</u> men and women raise the

schooling level of their offspring and reduce family size. The coefficient of the predicted wage of the husband displays the "wrong" sign in the fertility equation, but its influence is not statistically significant in any of the equations.

Of the remaining variables, only infant mortality and the wife's age have significant effects, and only in the fertility equation. The value of the infant mortality coefficient suggests that in areas where the infant mortality experience of women is 10 percent above the mean for the nation, families appear to have two percent more births.

III. Female Work Experience, Employment Status and Birth Expectations: Sequential-Decision-Making in the Philippines

The purpose of this section is to explore the relationship between the labor-market experience and fertility of women in the Philippines by examining the interactions between female work experience, current labor-force activity and birth expectations within a generalized sequential decision-making framework. Past studies of the female employment-fertility relationship in less-developed countries have for the most part focussed on the simple or partial relationship between the current employment status or labor-force participation of women and their retrospective fertility which, as has been generally recognized by the authors, does not provide sufficient information regarding a crucial policy question--whether or not increasing female employment will reduce family size (Carleton, 1965; Goldstein, 1972; Gendell, Marviglia , and Kreitner, 1971; Jaffe, 1959; Knodel and Prachuabmoh, 1973; Stycos and Weller, 1968; Sweet, 1971). We also attempt to show that the utilization of a sequential choice framework extended to take into account the accumulation of market skills by women who work and the jointness of labor-force participation and birth decisions provides a potentially better method of understanding and measuring the impact of female employment-creation on fertility and imp roves our ability to predict among older couples who will have additional children.

The fundamental notion underlying the general hypothesis that fertility decisions should be viewed as a sequential process is that the birth of each child alters parental perceptions in a way not entirely anticipated, causing a reevaluation of initial decisions at each parity. (Mishler and Westoff, 1966; Namboodiri, 1973). Thus it is presumed useful in empirical studies based on this perspective to examine decisions to have an additional child by birth parity (Davidson, 1972; Namboodiri, 1973; Simon, 1975a and 1975b). However there is evidence which strongly suggests that past employment as

well as fertility behavior may also alter current decisions regarding births, since as emphasized in the economic theory of human capital (e.g., Becker, Ben-Porath, 1967) and has been demonstrated in a number of studies based on developed country data (Malkiel and Malkiel, 1974; Mincer and Polachek, 1974) the level of past work experience is a significant determinant of the wage rates received by women currently. Thus, a major component of the opportunity cost of bearing children will tend to increase over the life-cycle and vary according to how much a women has worked in previous periods. Given that a woman's potential wage and the number of children living in the household influence the extent of her current participation in the market (Bowen and Finegan, 1969) and that market employment and child-rearing may be competitive female activities, these findings together suggest that current decisions regarding whether to have additional children and whether or not to enter the labor market may be jointly influenced not only by the number of children already born (or still living) but by the amount of human capital accumulated by women after completing their schooling.

One consequence of the accumulation of work experience and skills by women over the life cycle is that female schooling attainment may be a less reliable indicator of the opportunity cost of an additional birth among older women who have had a greater opportunity for employment, especially if in addition school-produced market skills atrophy. Moreover, because disparities in work histories are likely to be greater for older than for younger women, the omission of work experience variables from fertility regression equations, say, may result in the explanatory power of socioeconomic variables being significantly reduced for older cohorts of women, as in Snyder, 1974. The effects of

socioeconomic characteristics on birth expectations or fertility may also appear to differ significantly by parity and age (Namboodiri, 1973, Rosenzweig and Seiver, 1975) or work status (Simon, 1975) when differences in female work histories are neglected due to the probable high (negative) correlation between birth parity and the past employment of women.

In a more general but simplified sequential framework, whether or not a woman expects to bear additional children at age i B_i (1 = yes, 0 = no) and how much she participates in the labor market L_i will be (age-specific) functions of the existing stock (and/or composition) of children C_i, the accumulated stock of wage-augmenting work experience E_i at age i and a vector of characteristics of the household which remain constant throughout the marriage X_B and X_L,

(1) $$B_i = f_i (C_i, E_i, X_B)$$

(2) $$L_i = g_i (C_i, E_i, X_L)$$

where

$$C_i = \sum_{j=0}^{i} B_j$$

$$E_i = \sum_{j=0}^{i} a_j L_j$$

a_j = proportion of working time improving market skills.

If women with a higher E_i are able to earn higher wage rates, it would be expected that $\delta L_i/\delta E > 0$ and $\delta B_i/\delta E_i < 0$ for given C_i, X_L, X_B.

To obtain more precise and detailed "predictions" would require a more complex and detailed model of sequential choice that is beyond the scope of this exercise. This framework, however, which highlights the distinction between variables representing current decisions (or expectations) and variables embodying the results of past and currently unalterable behavior, makes it clear that measuring the (simple or partial) "influence" of current female employment status on children ever born is an innapropriate means of discerning the impact of the encouragement of female employment on fertility since C_i represents the culmination of past fertility behavior and is more likely a determinant of L_i. In the next sections, this framework is applied to household data from the Philippines which contains information on the work histories of women. It is shown that Philippino women with greater work experience earn significantly higher wages, that work experience bears a similar positive relationship to their current labor force status, that family size has a significant negative impact on women's decisions to participate in the labor market, and that both parity and work experience for women in the older age groups significantly influence birth expectations.

The Data

To test for the relationships between current work status, work experience, and birth expectations, data extracted from the 1973 National Demographic Survey of the Philippines, a countrywide representative sample of 8,434 households conducted by the Philippines Population Institute, are utilized. The sub-sample of households used in this study is restricted to those of married women aged 15-44 in which both spouses are present and neither has been married more than once. The size of this sub-sample ranges from 3563 to

women, depending on the number and quality of the variables utilized. Of these women approximately 85 percent indicated that they had heard of or had used either of five contraceptive devices (pill, foam, foam tablets, I.U.D., condom), and 22 percent reported that they were using or had used at least one contraceptive method.

Table 1 displays selected characteristics of the women in the sample by duration of marriage stratified according to whether the husband reported that his main work activity was agricultural. If the values of the duration-specific characteristics of the cross-sectional sample of Philippino women roughly correspond to those of a cohort of women observed over time, the accumulation of work experience and children with marital duration is clearly displayed for all sample groups, with the farm women exhibiting a somewhat greater lifetime work commitment and higher fertility. By no means are all women accumulating employment experience, however, as 40 percent of the women in the highest duration group had worked less than a year during their 26-30 years of marriage.

The pattern of current labor-force participation, defined as working for pay, appears to be U-shaped in the total and non-farm populations but displays no apparent pattern among farm women, more of whom appear to work for pay in the later marital stages than do non-farm women. Not surprisingly, however, a greater proportion of non-farm Philippino women are employed outside the household then are farm women but non-household employment appears to increase with length of marriage for all groups.

Table 2 presents the number of children ever born to women at different 5-year stages of marriage according to 1) current employment status, defined

Table 1

Percent Married Women Currently Employed, Employed Outside the Household, Mean Years of Marital Work Experience, Mean Children Ever Born by Duration of Marriage: Total, Non-Farm, Farm Populations

Years of Marriage	1-5	6-10	11-15	16-20	21-25	26-30
			Total (3563)			
Percent Employed	8.2	16.3	19.6	17.9	15.2	14.7
Percent Employed Outside Household	2.8	3.9	4.8	5.0	5.6	7.9
Years Work Experience	0.75	2.10	2.79	4.12	5.17	6.19
Children Ever Born	1.74	3.48	4.96	6.27	7.18	7.13
			Non-Farm (1782)			
Percent Employed	10.8	16.7	18.3	20.8	13.3	10.8
Percent Employed Outside Household	3.9	4.6	6.0	7.9	7.4	8.0
Years Work Experience	0.75	2.16	2.91	4.23	4.84	5.34
Children Ever Born	1.74	3.37	4.81	6.12	6.88	6.76
			Farm (1781)			
Percent Employed	5.9	14.7	20.6	13.2	17.6	20.6
Percent Employed Outside Household	1.6	2.8	3.6	2.6	4.1	7.5
Years Work Experience	0.74	2.04	2.68	4.02	6.11	6.91
Children Ever Born	1.74	3.61	5.06	6.40	7.39	7.46

Source: 1973 Philippines NDS data tape.

Table 2

Children Ever Born by Current Employment Status, Work Experience, and Duration of Marriage-Total, Non-Farm, Farm Populations

Years of marriage[a]	Employed Outside Household		Work Experience	
	No	Yes	Low	High
		Total		
1-5 (3)	1.737	2.400 (539)	1.500	1.593 (129)
6-10 (8)	3.477	3 267 (770)	3.417	3.255 (162)
11-15 (13)	4.958	4.583 (747)	5.184	4.764 (169)
16-20 (18)	6.268	5.273 (661)	6.206	5.868 (155)
21-25 (23)	7.176	7.929 (499)	7.105	6.711 (111)
26-30 (28)	7.128	7.333 (340)	6.980	5.400 (64)
		Non-Farm		
1-5 (3)	1.737	2.545 (304)	1.574	1.722 (72)
6-10 (8)	3.365	3.100 (426)	3.431	3.323 (89)
11-15 (13)	4.843	4.409 (360)	4.913	4.500 (74)
16-20 (18)	6.117	5.600 (315)	6.038	5.481 (79)
21-25 (23)	6.878	7.750 (213)	7.621	6.375 (45)
26-30 (28)	6.757	7.308 (161)	6.143	5.700 (31)
		Farm		
1-5 (3)	1.736	2.000 (235)	1.417	1.333 (57)
6-10 (8)	3.614	3.600 (344)	3.393	3.176 (73)
11-15 (13)	5.062	4.857 (387)	5.368	5.037 (95)
16-20 (18)	6.396	4.250 (346)	6.380	6.269 (76)
21-25 (23)	7.391	8.167 (286)	6.800	7.048 (66)
26-30 (28)	7.461	7.357 (178)	7.630	5.167 (33)

Source: 1973 Philippines NDS data tape

to maximize the conflict between child-rearing and employment, according to whether or not the woman was working for pay away from the household, and 2) by whether or not the women's past employment experience exceeded the mean for her duration group. Because both years of work and births are positively correlated with duration of marriage, single-year marital groups (in parentheses) were used for the latter comparisons. The sample was again stratified by the agricultural activity of husbands.

As indicated in the previous section, work status tabulations are not informative with regard to the relationship between fertility and female employment; they are presented here for comparative purposes only. The work status patterns displayed are similar to those found in Goldstein (1972) based on household data from Thailand--'economically active' women in the younger duration cohorts exhibit significantly lower fertility than their 'non-active' counterparts but these fertility differentials are reversed for the older groups. This pattern is replicated in both the farm and non-farm households in the Philippines data.

Contrary results are obtained with respect to work experience and fertility. Here in the two oldest duration cohorts, where disparities in work histories are widest, fertility is significantly lower for women with above-average employment experience. These findings are merely suggestive, however, since both variables are the product of past behavior and sequential fertility and labor-force participation decisions. Moreover, characteristics which may be correlated with female employment and fertility are not controlled for in these tables.

Female Work Experience and Earnings

In order to demonstrate that a woman's past employment experience has a direct economic effect on her current employment and fertility behavior in the Philippines it is necessary first to establish that Philippino women who have spent a greater amount of their time in the labor market in the past receive, ceteris paribus, higher wage rates currently. An ordinary least squares (OLS) multiple regression analysis is thus applied to a sample of working married women aged 15-59 who reported that they had received income in the past month. The dependent variable used, the natural logarithim of the hourly wage, was computed by dividing the value of income received in cash and/or in kind during the year by the number of hours worked in the month (= days worked in the month multiplied by hours per day) multiplied by twelve. The independent variables consist of the number of years the wife has attended school, her age, the schooling of her father, whether or not she was engaged in agricultural work (= 1 if farm, = 0 if non-farm), the number of years worked prior to the date of the survey interview, and the number of years of work experience squared. The latter quadratic variable was employed to test for the non-linearities found by other researchers in wage regressions applied to U.S. data (Malkiel and Malkiel, 1974; Mincer and Polachek, 1974). It is important to note, however, that the work experience variable employed is an imperfect proxy for the level of market skills acquired by women on the job since, among other reasons, the distribution or discontinuity of employment over the life-cycle as well as the total number of years worked, the only variable provided in the data, may importantly affect current productivity (Mincer and Polachek, 1974). Thus, the coefficients of the experience variables

may be biased toward zero. The regression results are provided in equation (3).

$$\text{(3)}\quad \ln \text{Wage} = -1.64 + \underset{(.005)}{.056^{*}}\ \text{schooling} + \underset{(.006)}{.055^{*}}\ \text{experience} - \underset{(.0002)}{.0015^{*}}\ (\text{experience})^{2}$$

$$+\underset{(.0019)}{.0087^{*}}\ \text{age} + \underset{(.065)}{.202^{*}}\ \text{farm} - \underset{(.006)}{.009}\ \text{father's schooling}$$

R^2 (adj) = .092 n = 2503

(standard errors in parentheses)

*significant at the 1 percent level

All the coefficients are statistically significant, with both female schooling and work experience contributing positively to the wages women earn. The coefficient values indicate that an increase in work experience of one year is associated with a 6 percent increase in female wages, evaluated at the sample means, the returns to experience diminishing as the level of work experience rises. Thus it appears that among women of the same age and formal schooling, those who have greater work experience do earn more when employed. These findings must be interpreted with caution, however, since it may be that women who expect to earn higher wages in the future both attend school and participate in the labor market for longer periods of time, thus creating a spurious positive correlation between wages earned and the schooling and experience variables. As this simultaneity problem is not unique to this study, no further attempts are made to construct the simultaneous equations system required to solve this pattern. Moreover, the estimated coefficients, obtained from a sample of working women, may differ from those relevant to the non-employed women excluded from the sample.

Work Experience, Children and Current Employment

In this section we attempt to apply equation (2) to the data in order to show that accumulated work experience and family size importantly influence current decisions regarding whether women currently seek market work. The superior empirical procedure, the division of the sample into cells according to all the relevant characteristics of the households and the measurement within cells of the relationship between parity, work experience and the wife's current labor-force participation, is not utilized because the size of the total sample, the number of socio-economic and demographic control variables, and the ubiquitous missing variables problem result in too many empty cells. Instead OLS multiple regression, which unfortunately imposes a linear structure to the model, is again used. To test for potential non-linearities and interaction affects, quadratic and first-order intention terms are also tried.

The dependent variable is the number of hours women worked for pay in the month preceding the survey interview. As 85 percent of the women worked no hours (for pay), the usual OLS assumption that the dependent variable is distributed normally is probably violated, which may bias the results (Amemiya, 1973). Results obtained utilizing a dichotomous variable and employing the generalized least squares procedure described in the next section were qualitatively identical to those reported below, however.

The independent variables employed, aside from family size (number of live children) and work experience,are wife's age,wife's age at marriage, wife's years of schooling, husband's age, husband's schooling, husband's potential wage, the child mortality rate of the province in which the family resides,

contraceptive knowledge (= 1 if the wife has heard of or used the five methods listed in section II, = 0 otherwise). While it would be expected that the potential wage of the wife would also be an important determinant of her decision to work, equation (3) is not utilized to impute a potential wage to women who are not working, since the coefficients obtained from the sample of working women may not provide an unbiased prediction of the price of time of non-workers (Gronau, 1974). Instead, a reduced-form equation is utilized in which the determinants of the potential wage are entered directly in the work activity equation. The female age, education, and work experience variables should therefore display effects in the labor-force participation equation qualitatively similar to those exhibited in equation (3) as long as the non-economic influences embodied in these variables are not strong.

The expected wage of the husband is an instrumental variable obtained from an auxiliary OLS multiple regression in which the natural logarithim of the computed hourly wage of working husbands is regressed against the husband's schooling attainment age, age squared, and occupation and the schooling level of the husband's father. Since the higher the husband's earnings, the greater household income and thus the greater the household demands on the time of the wife, the coefficient of the husband's wage variable should exhibit a negative sign. The effects of the husband's age and schooling on the employment of the wife in the presence of the male wage variable , however, cannot be stated a priori.

The number of children in the household would also be expected to exert an inhibitive effect on the wife's market employment, provided that older children do not readily substitute for the mother in child-care. The age-composition of children may thus also be an important determinant of the wife's

current participation in the labor market, but this variable is omitted in this study. Sweet (1971) has found, however, that the number of children in the family significantly reduces current female employment whether or not compositional effects are accounted for.

The coefficient sign of the dummy variable representing farm status would be expected to be negative, since women whose husbands are engaged in farming may be more likely to be employed as unpaid family workers. The child mortality coefficient should display a negative sign in the employment equation as well since women in an environment of high child mortality might refrain from participating in the labor market in order to bear more children, as indicated by the positive ecological correlation between infant mortality and children ever born obtained by Harman (1970) in his study of 1968 Philippines household data.

Women with a knowledge of contraceptive techniques may work more because of their potentially superior control over current fertility while wife's age at marriage may have a negative coefficient if women of the same age who have postponed marriage attempt to "catch up" by bearing more children in a fewer number of years.

Table 3 contains the parameters estimated using OLS multiple regression. No significant first-order age or parity interaction effects were found and thus only linear specifications are reported (except for regression (4)). In addition, the family size and work experience variables are entered in a step-wise manner in order to assess the degree of specification bias created by the omission of these life-cycle variables.

Table 3

Regression Coefficients: Hours Worked in Month, Married Women Aged 15-44[a]

Independent Variables	Regression Number (1)	(2)	(3)	(4)
Age at Marriage	-.8709*	-1.563*	-.5328	-1.040*
	(.3685)	(.4154)	(.3822)	(.3729)
Age of Wife	1.698*	2.410*	.9577*	1.1883*
	(.3112)	(.3687)	(.3426)	(.3329)
Education of Wife	3.392*	3.321*	2.528*	2.122*
	(.5163)	(.5155)	(.4724)	(.4594)
Education of Husband	.5347	.5529	.3826	.4065
	(.4796)	(.4786)	(.4374)	(.4245)
Expected Wage of Husband	-.0007*	-.0007*	- .0006*	-.0006*
	(.0002)	(.0002)	(.0002)	(.0002)
Age of Husband	-.1296	-.1419	-.1100	-.0704
	(.2425)	(.2421)	(.2212)	(.2147)
Child Mortality	.0779*	.0717*	.0081	.0249
	(.0300)	(.0300)	(.0276)	(.0268)
Contraceptive Knowledge	-15.593*	-14.637*	-3.785	-4.005
	(3.762)	(3.763)	(3.469)	(3.368)
Farm	-5.988*	-5.654*	-8.696*	-8.846*
	(2.910)	(2.905)	(2.658)	(2.580)
Live Children		-2.728*	-1.859*	-1.957*
		(.7608)	(.6962)	(.6758)
Work Experience			5.412*	12.671*
			(.2299)	(.5936)
Work Experience Squared				-.4293*
				(.0325)
R^2 (adj.)	.076	.081	.232	.277
F-ratio	24.25	23.31	71.77	83.74
d.f.	2805	2804	2803	2802

[a]Standard errors are in parentheses.

*Significant at .05 level, two-tailed test.

Source: 1973 Philippines NDS data tape.

In regression (1), with children and work experience omitted, all the coefficients of the included variables are statistically significant except for husband's age and schooling and all but those of the child mortality and contraceptive knowledge variables display the predicted signs. The coefficients of the latter two, however, lose their statistical significance when both the children and experience variables are entered in the complete specification (4).

The number of live children, entered in regression (2), appears to have a statistically significant negative impact on the current employment status of women as expected, controlling for demographic and socioeconomic characteristics and despite the low simple correlation (.0051) between these variables. Work experience, included in regression (3), also has the predicted (positive) effect and its coefficient is statistically significant. Moreover, the addition of the work experience variable in (3) almost triples the explanatory power of the equation, after adjusting for the decrease in degrees of freedom, and significantly reduces the coefficients of the female education, child mortality and contraceptive knowledge variables. The exhibited relationship between work experience and current female employment is quite strong--at the mean (2.7 years), women with one more year of work experience work an additional 11.5 hours per month or approximately 40 percent more in the current period. The addition of one child to the household, however, appears to reduce the labor-force participation of the wife by approximately two hours per month or by seven percent.

These results are consistent with the hypothesis that the number of children a woman has had and her past employment experience are important

determinants of her current labor-force behavior. In conjunction with equation (3), they also support the more specific economic hypothesis that among women who are otherwise similar, those who have been employed in the market longer in previous years work more currently because their opportunity cost (potential wage rate) is higher. A competing hypothesis, also consistent with the results of regression (3), is that the coefficient of the work experience variable is picking up the effects of unobserved variables, such as tastes, which are correlated with both current and past labor-force behavior. That is, the influence of unobserved variables which may have generated the difference in work experience among women with identical observed characteristics in the past may persist, i.e., be serially correlated. However, an additional implication arising out ot the "price of time" but not from the "tastes" hypothesis is that the magnitude of the positive effect of work experience on labor-force activity will decrease with the level of work experience since, as indicated in (3), the wife's potential wage is a positive but decreasing function of experience. As a further test, therefore, a quadratic experience term is added in regression (4). As in (3), the coefficient of this variable is negative and highly significant while the coefficient of the linear experience term retains its positive sign and significance. The replication of the non-linear experience effect in the labor-force and wage equations thus tends to favor the "price of time" hypothesis; the coefficients, however, may still overestimate the impact of increasing female work experience on labor-force decisions in the current period due to the impossibility of eliminating the serial correlation problem with the data available(Heckman and Willis, 1975).

Work Experience, Parity, and Birth Expectations

To test for the relationship between the accumulated work experience of women and their subsequent fertility within a sequential decision-making framework, work history data is required which corresponds to that supplied in a pregnancy roster, i.e., the amount of time spent by women in the labor market within each birth interval. With such data, a parity-progression on birth-order transition analysis utilizing female work experience could be performed, as in Simon (1975a, 1975b). The 1973 Philippines National Demographic Survey, however, provides information only on the total number of years worked by women (and worked during marriage) as of the data of the sample survey. It is impossible, therefore, to directly ascertain how a women's past employment history affects her actual subsequent fertility with this data set. Information is provided, however, on the number of additional births expected by women, also as of the date of the survey which may be used as an indication of future fertility plans. Birth expectations are thus related to birth parity and female work experience as well as other socioeconomic variables in a multiple regression analysis to test if the accumulation of market skills by women influences birth decisions sequentially.

The dependent variable used to represent the decision to have an additional child is dichotomous, equal to 1 if the woman expects to have one or more additional children and to 0 if she expects no additional births. Because this variable is not distributed normally, violating an assumption of OLS regression analysis, the generalized least-squares procedure described by Goldberger (1964, pp. 249-250) is employed to obtain unbiased coefficient standard errors. The sample used is additionally restricted to married

women aged 15-44 who had had at least one birth and who provided information on expected children.

The set of independent variables is identical to that used in the preceding labor-force participation regressions with the addition of the age or parity interaction effects found to be statistically significant. The expected qualitative influence of the variables in the birth expectations equation would, however, in general be opposite to those effects obtained in the labor-force regressions. For instance, it would be expected that wife's schooling would have a negative influence on additional births, since wife's schooling is a correlate of one component of her value of time, as indicated by equation (3), and is positively related to her current participation in the labor market (Table 3). We would also expect the level of child mortality in the municipality to have a positive and contraceptive knowledge a negative effect on additional births. As we are primarily interested, however, in testing if women with larger amounts of work experience tend to expect less births, a more detailed discussion of the other variable coefficients is beyond the scope of this paper.

The birth expectations regression results obtained from the total sample are presented in Table 4. Coefficients of age-education (of the wife) and age-parity interaction variables are also reported as these were found to be statistically significant in the search for age or parity first-order interactions. In regression (1) of Table 4, containing all the independent variables except work experience, all coefficients except that of the predicted husband's wage display signs consistent with expectations and those of wife's age, number of live children, wife's schooling, contraceptive

Table 4

Regression Coefficients: Expecting Additional Children, Married Women Aged 15-44[a]

Independent variables	Regression Number (1)	(2)	(3)	(4)	(5)
Age at Marriage	.0130	.0129	.0121	.0143	.0133
	(.0109)	(.0109)	(.0109)	(.0108)	(.0108)
Age of Wife	-.0957*	-.0959*	-.0959*	-.0968*	-.0947*
	(.0158)	(.0158)	(.0158)	(.0158)	(.0158)
Live Children	-.4048*	-.4047*	-.4022*	-.4144*	-.4489*
	(.0839)	(.0839)	(.0839)	(.0836)	(.0851)
Age of Wife x Children	.0097*	.0097*	.0096*	.0101*	.0109*
	(.0023)	(.0023)	(.0023)	(.0023)	(.0023)
Education of Wife	-.1359*	-.1361*	-.1328*	-.1242*	-.1239*
	(.0474)	(.0474)	(.0475)	(.0471)	(.0471)
Education of Wife x Age of Wife	.0029*	.0029*	.0028*	.0026*	.0026*
	(.0014)	(.0014)	(.0014)	(.0013)	(.0013)
Education of Husband	.0025	.0024	.0025	.0023	.0011
	(.0126)	(.0126)	(.0126)	(.0125)	(.0125)
Expected Wage of Husband	-.0000	-.0000	-.0000	-.0000	-.0000
	(.0000)	(.0000)	(.0000)	(.0000)	(.0000)
Age of Husband	.0072	.0072	.0071	-.0079	-.0080
	(.0066)	(.0066)	(.0066)	(.0066)	(.0066)
Child Mortality	.0009	.0009	.0009	.0009	.0010
	(.0008)	(.0008)	(.0008)	(.0008)	(.0008)
Contraceptive Knowledge	-.4595*	-.4591*	-.4567*	-.4666*	-.4576*
	(.1040)	(.1040)	(.1040)	(.1041)	(.1041)
Farm	.0481	.0487	.0458	.0409	.0352
	(.0783)	(.0783)	(.0783)	(.0779)	(.0779)
Monthly Hours		.0003	-.0069		
		(.0008)	(.0049)		
Monthly Hours x Age of Wife			.0002		
			(.0002)		
Work Experience				.0090	.1073*
				(.0067)	(.0476)
Work Experience x Age of Wife					-.0028*
					(.0012)
R^2(adj)	.108	.108	.109	.109	.110
F-ratio	17.87*	16.60*	15.65*	16.83*	16.03*
d.f.	1801	1800	1799	1823	1822

[a]Observations weighted by $[\hat{Y}_i(1-\hat{Y}_i)]^{-1/2}$, where the Y_i are the predicted values of the dependendent variable obtained from OLS regressions. Standard errors are in parentheses.

*Signficant at .05 level , two-tailed test.

Source: 1973 Philippines NDS data tape.

knowledge, and the age-parity and age-education variables are statistically significant. More importantly, the positive sign of the coefficient of the latter interaction variable is consistent with the hypothesis stated in the first section that the negative effect of the wife's schooling on fertility would be less strong for older than for younger women since among the former work experience may dominate schooling as a proxy for the wife's value of time.

The number of hours worked for pay by women in the month preceding the sample survey is added in regression (2) to test if the wife's current labor-force participation affects her birth expectations. The monthly hours coefficient, however, displays the wrong sign and is statistically insignificant. In regression (3), monthly hours is interacted with the age of the wife to see if the birth expectations effect of curren employment status varies with age. The signs of the linear and interaction coefficients do differ, but neither is statistically significant. These results thus suggest that whether or not the wife is currently in the labor market has little influence on her decisions to bear additional children, controlling for other socio-economic and demographic characteristics.

In regression (4), the number of years the wife has worked appears also to exert no significant effect on birth expectations. However, when the wife's age and work experience are interacted in regression (5), the coefficients of both the linear and interaction work experience variables attain statistical significance. Moreover, the coefficient values indicate that only for women above age 37 does work experience have the expected negative association with birth expectations. This result is not only

consistent with the simple duration-specific family size-work experience relations depicted in Table 2, but also further confirms the hypothesis that work experience is a more important component of the opportunity cost of female time than schooling for older women and than work experience for younger women.

To obtain more precise estimates of the age-experience and age-education differentials, the sample of women is sub-divided into three age-groups and regressions similar to (5) of Table 4 are run within each group. We would expect on the basis of regression (5) that work experience would only have a significant negative effect on expected births among women in the oldest cohort and that the wife's schooling coefficient should be smallest for this age group.

The regression results for the sub-samples are reported in Table 5. Because of the reductions in sample sizes, the coefficients are measured with considerably less precision. Indeed, none of the coefficients attain statistical significance in the 15-24 year old group of women, although the equation as a whole is statistically significant. The coefficient values in all age groups appear, however, to be consistent with those obtained for the whole sample. Most importantly, the results confirm the hypothesis that the wife's schooling is a less good and work experience a better proxy for the value of the wife's time among older women. The number of years worked by women, as expected, has a statistically significant effect only in the 35-44 year old cohort, exerting a negative influence on birth expectations for women above age 36. In addition, the (negative) effect of the wife's schooling on expectations of additional births is considerably less strong in the most mature age-group than in the two younger cohorts of women.

Table 5

Regression Coefficients: Expecting Additional Children by Age Cohorts[a]

Independent variables	Age Cohort 15-24	25-34	35-44
Age at Marriage	0.0640	.0089	.0062
	(.0612)	(.0219)	(.0115)
Age of Wife	-.1430	-.1599*	-.0560
	(.1660)	(.0688)	(.0498)
Live Children	-.6594	-.7142	-.3072
	(1.135)	(.3779)	(.2566)
Age of Wife x children	.0067	.0195	.0073
	(.0508)	(.0123)	(.0065)
Education of Wife	-.3351	-.3724*	-.0990
	(.3965)	(.1553)	(.1440)
Education of Wife x Age of Wife	.0146	.0106*	.0019
	(.0174)	(.0052)	(.0036)
Education of Husband	.0357	.0074	.0021
	(.0379)	(.0214)	(.0156)
Expected Wage of Husband	-.0000	-.0000	-.0000
	(.0000)	(.0000)	(.0000)
Age of Husband	.0156	.0083	-.0138
	(.0193)	(.0110)	(.0083)
Child Mortality	.0001	.0020	.0007
	(.0023)	(.0015)	(.0011)
Contraceptive Knowledge	-.3149	-.9139*	-.1110
	(.2786)	(.1891)	(.1261)
Farm	.2654	-.0469	.0769
	(.1967)	(.1342)	(.1023)
Work Experience	.2990	.2283	.3040*
	(.7365)	(.1790)	(.0882)
Work Experience x Age of Wife	.0128	-.0079	-.0084*
	(.0334)	(.0058)	(.0022)
R^2 (adj)	.064	.080	.031
F-ratio	2.22*	4.26*	2.57*
d.f.	267	776	748

[a]Observations weighted by $[\hat{Y}_i(1-\hat{Y}_i)]^{-1/2}$, where the $\hat{Y}_i$ are the predicted values of the dependent variable obtained from OLS regressions. Standard errors in parentheses.

*Significant at .05 level, two-tailed test

Source: 1973 Philippines NDS data tape.

IV. Summary and Conclusions of Analysis

The methodological considerations and empirical results of parts two and three provide information not only on the influence of economic variables on family size, child schooling and employment decisions but also suggest the kinds of data required to more fully understand the interactions between fertility, education, and economic development. Among the conclusions are:

1) Consideration of the schooling and labor contribution of children and the work history of mothers together with the fertility behavior of the household appears to provide richer insights into the influences of socio-economic characteristics on family size choice. The results obtained from the analysis of two micro data sets from the Philippines support the usefullness of the economic model of the household and demonstrate the need for more detailed information on the role and activities of children inside as well as outside the household to supplement demographic and economic data.

2) While few data sources supply information on variables influencing the economic returns to bearing children or to child schooling, the analysis in part three revealed that one variable directly related to children's pecuniary contribution, the market wage rate of children, was significantly and positively associated with the children ever born to women aged 35-49. Moreover, it was also found that in a. families residing on a farm, children, particularly sons, tend to work more hours and to have lower school attainment rates, controlling for a large number of parental characteristics. These results strongly suggest that the payoff to the collection of data relating to the "economic" benefits of children in future surveys might be high; in

particular, the wages children earn and the resources they work with in agricultural production.

The results also suggest that information on the benefits and costs of schooling children--the quality of schools (size, budget, faculty-student ratio), distance to school and variables representing the dynamic aspects of the economy, such as agricultural productivity change, may also influence the returns to education and may be an important aspect of the link between economic development, schooling, and family size.

3) A sequential decision-making framework which jointly considers the employment as well as pregnancy history of women was also found to be a useful methodology with which to study fertility behavior in developing countries. The general importance of changes in family size and the accumulation of market skills by women over time suggested by the empirical results obtained in part three provides evidence that future demographic surveys must also seek information on the work histories of women--the extent of, timing, and location of employment throughout the life-cycle. In terms of population policy, the findings also strongly suggest that encouraging women to work when they are young would result in women working more in the later stages of their life-cycle and would tend to reduce fertility in the later years of child bearing.

4). The findings of part three also shed additional light on the roles of female education in fertility behavior. One of the most important and consistent findings in empirical studies of the determinants of family size is the negative correlation between female schooling and fertility (see Schultz (1973)). The interpretation of this relationship, however, is

made difficult by the fact that schooling may be correlated with a number of other factors influencing fertility not usually controlled for as a result of data or other limitations. One hypothesis, that female education is a correlate of the wife's time value, is supported by the results obtained in part three. Two other hypotheses explaining the negative impact of the education of women, however, are that female schooling is positively associated with contraceptive knowledge and that women who desire to work more and thus to have less children have greater incentives to and acquire more education (Nerlove, 1974). In this study, however, the schooling of women appeared to have a statistically significant negative effect on the desire for additional children, holding constant (or among women with the same) contraceptive knowledge and number of years worked. Thus while female education does appear to be positively associated with the knowledge of contraceptive techniques (simple correlation = .25) and female labor-force participation (Table 3, part 3), it still appears to exert an attenuating effect on fertility expectations when the influence of these other factors is removed. Moreover, the educational attainment of the wife (and husband) appears to be significantly and positively associated with the schooling of their children, (part two), suggesting that increasing the schooling of women will both tend to reduce family size and to raise the educational level of children in LDCs.

V. Suitability of Existing Data Sets and Possible New Surveys in Indonesia and the Philippines

Indonesia

1) Three sources of aggregate data referring to the same period (1970-71)--the 1971 Population Census of Indonesia, Social Indicators, 1971, and statistics from the Ministry of Agriculture (available from the author)--jointly provide excellent coverage of fertility and the schooling and labor-force participation of children. The data include, besides age and sex-specific school enrollment rates, schooling attainment and labor force status, information on 1) the number of pupils, teachers and schools by schooling level, enabling the construction of two measures of the quality of schools (faculty-student ratio, average school size) and 2) agricultural inputs potentially influencing the returns to child labor-- average size of landholdings, irrigated acres, production and area by crop, and average rainfall.

The major shortcoming of these sources, however, is that the variables are reported for the 24 provinces of Indonesia, providing an insufficient number of "observations" (and degrees of freedom) for a suitable econometric analysis. Unfortunately, too, data available at a lower level of aggregation (districts) from other sources are not sufficiently comprehensive to permit an analysis which would add to our understanding of child-related family decision-making behavior. Moreover, an additional shortcoming of the province-level data is that they contain no information or wage rates or income.

2) An Indonesian household-level data source, the Sriharjo (Mojolama) Fertility and Family Planning Project Survey, also does not appear to provide the range of variables needed for further work on the economics of children.

Ever-married women aged 15 or over in a rural community in the Yogyakarta Spinal Region were surveyed in 1969 and 1970 (772 households). Responses to detailed questions on marriage, divorce, fecundity, pregnancy histories and breast feeding and other demographic information are provided as well as data on parental years of schooling, the occupation of the husband (5 groups), the value of the house owned, and land size. While the land area variable is a unique feature, the lack of information on child schooling or work activities, income, other agricultural inputs or work histories, renders this data set of little use for understanding the set of activities associated with children in LDCs.

In general, the existing data base in Indonesia does not appear adequate to support a study of the interrelationship between the activities of parents and children based on the economic framework outlined in the previous sections of this report. A new Indonesian survey which collected information on the work and pregnancy histories of women, the schooling, market, and household activities of children, agricultural inputs, and characteristics of schools would seem to be warranted.

Preliminary discussions were held with the Director of the Institute of Population Studies of Gadjah Mada University in Jogyakarta, Dr. Masri Singarimbun, concerning the possibility of a new survey. The Insitute has conducted a fertility survey in a nearby village (the Sriharjo-project) and thus has available personnel with survey experience. At the time of these conversations, the Institute was planning to participate in the International Value of Children project, comparing the value of children in Central and

West Java and Dr. Singarimbun. appeared enthusiastic about a collaborative survey which was aimed at the economic aspect of children as outlined here. With Dr. Singarimbun and the Institute as a collaborator, an intensive survey conducted in the area around Johyakarta appears to be the most promising route to obtaining data in Indonesia suitable for a detailed economic analysis of the activities of children and fertility.

The Philippines

1) Two of the best existing sources of household data on the economics of children in the Philippines are the 1968 and 1973 National Demographic Survey (NDS) tapes, compiled by the Philippines Population Institute.
The data provided in the former, utilized in part 2 of this report, are particularly useful for analyzing the economic activities of children since questions concerning recent labor-force behavior, schooling, and income were asked of all household members aged 10 or above. The shortcomings of this set are, however, that no information is provided on children who have left the household, on agricultural inputs, schools, or the retrospective work experience of women.

The 1973 NDS data, while unfortunately providing no information on children other than age and sex and less detailed information on income than the 1968 survey, does report on a variable which appears to be very important--the work experience accumulated by women. Thus a more accurate computation of the value of the wife's time and a more precise analysis of the role of the wife's "price of time" in fertility and employment decisions (part 3 of this report) can be performed with this data.

2) As a last phase of this project, the variables common to the two NDS tapes were aggregated by province and combined to form a "new" pooled aggregate data set with 65 observations for each of the two years. Because the questions asked in each survey do not correspond exactly, this pooled set is less useful than it might have been since the schooling and work behavior of children (missing in the 1973 survey) and the work experience of the wife (not provided in the 1968 survey) had to be excluded. The major advantage of this data, pertaining to two points in time, are that they may potentially provide, using suitable econometric techniques (as in Nerlove and Schultz, 1971 and Schultz, 1973), further insight into the dynamics of fertility determination.

3) Other potentially useful sources of aggregate data, not fully available at the time the author was in the Philippines, are the 1970 Population and Agricultural Censuses of the Philippines, which provide information on farms and farm production inputs, age and sex-specific schooling (attainment and enrollment),employment status, and children ever born(province) to women by age for each of 50 provinces and, in most cases, municipalities. Live births, by province, are available from the"Yearbook of Philippines Statistics" (annual) and data on schools at the province level is provided in "School Statistics," Board of National Education and the "Bureau of Public Schools Statistical Bulletin" (annual).Child-woman ratios for municipalities can be computed from the age-distributional census data. A detailed econometric analysis based on these sources, combined with similar data from 1960, should be of highest priority in the further exploration of the economics of family decisions concerning children.

Discussions regarding a new sample survey in the Philippines concerned with acquiring more detailed information on the activities, costs and benefits of children particularly in rural-agricultural areas were held with Mary Hollensteiner, Director of the Institute of Philippino Culture. The Institute has conducted national sample surveys in the past and is, in addition, an important member of the PSSC Research Network, a collection of 22 research organizations located in different areas of the country. The advantage of such an affiliation is that each center in the network can be called upon to participate in a coordinated country-wide survey, facilitating the organization of such a project. Mahar Magahas, Professor of Economics at the University of the Philippines, in conversation with the author in the Philippines last December and at Yale in August expressed interest in a study of the linkages between child schooling, adult schooling and fertility in the context of making projections of the economic development of the Philippines over the next decades. He would make an excellent collaborator on the research aspect of a study of these issues based on data that would be forthcoming from a new sample survey in the Philippines designed specifically to investigate the interrelationships between schooling, employment, agricultural productivity, and the demand for children.

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